

REMARKS

In the October 4, 2007 office action, all pending claims were rejected as either being anticipated by, or unpatentable over the prior art.

Claim 19 was rejected under 35 USC 102(b) as being anticipated by USP 2,680,065 to Atwell (paragraph 3 of the office action). Claims 19-22, 25-31, 33-37, 40-43, 45, 94-99, 101-103, 105-109, 111 and 112 were rejected under 35 USC 102(b) as being anticipated by USP 5,752,994 to Monacelli (paragraph 4 of the office action). Claims 33-37 and 41-44 were rejected under 35 USC 102(b) as being anticipated by USP 5,306,481 to Mansour (paragraph 5 of the office action).

Claims 23, 100 and 110 were rejected under 35 USC 103(a) as being unpatentable over Monacelli in view of Tanca (paragraphs 7 & 8 of the office action). Claims 32, 44, 104 and 113 were rejected under 35 USC 103(a) as being unpatentable over Monacelli in view of Mansour (paragraphs 9 & 10 of the office action). Finally, Claim 38 was rejected under 35 USC 103(a) as being unpatentable over Mansour in view of Tanca (paragraph 11 of the office action).

Claims 19-23, 25-31, 33-38, 40-43, 45, 94-103, 105-112, as amended, and new claim 114 are pending.

Amendments to the Claims

All four independent claims (Claims 19, 33, 94 and 106) have been amended to recite the use of a “pulse combustion heater” to indirectly heat a fluidized bed. Accordingly, dependent claims 32, 44, 104 and 113, which formerly contained this limitation, have been canceled.

Independent Claim 19 has also been amended to recite that the second fluidized bed is separate from the first fluidized bed. Support for this language can be found in Fig. 5, in which the second fluidized bed 40 is separate from the first fluidized bed 14. Additional support can be found at paragraph [0110] where it is stated that the second fluidized bed 40 is shown separate from the first fluidized bed 14.

Dependent claim 27 has been amended to recite that the second fluidized bed is heated by oxidizing carbon in the bed without an external heat source. Support for this language can be found in the specification at paragraph [0104] where it is said that “of particular advantage, carbon oxidation increase the temperature of the bed eliminating the need to heat the bed using an external heat source.”

New dependent claim 114, which depends on claim 19, has been added. New claim 114 recites that the extracted solids and oxygen-containing gas are separately introduced to the second fluidized bed. Support for the new claim may be found at paragraphs [0086], [0104] and [0110] of the published application. Applicant notes that such as system of introducing extracted solids and oxygen via separately (i.e., not admixed prior to introduction to the second fluidized bed) is not taught by Atwell. Instead, Atwell discloses a process wherein the carbonaceous particles separated from the coal gas in separator 39 pass through line 42 into line 43 where they are admixed with a gas stream comprising oxygen and steam and then carried into the reaction zone 44. (see Atwell’s column 4, lines 57-63, and Fig. 2).

Rejection of Independent Claim 19 as being anticipated under 35 USC 102(b) by Atwell/Patentability of Claim 19 over Atwell in view of Mansour

Fig. 2 of Atwell reproduced below.

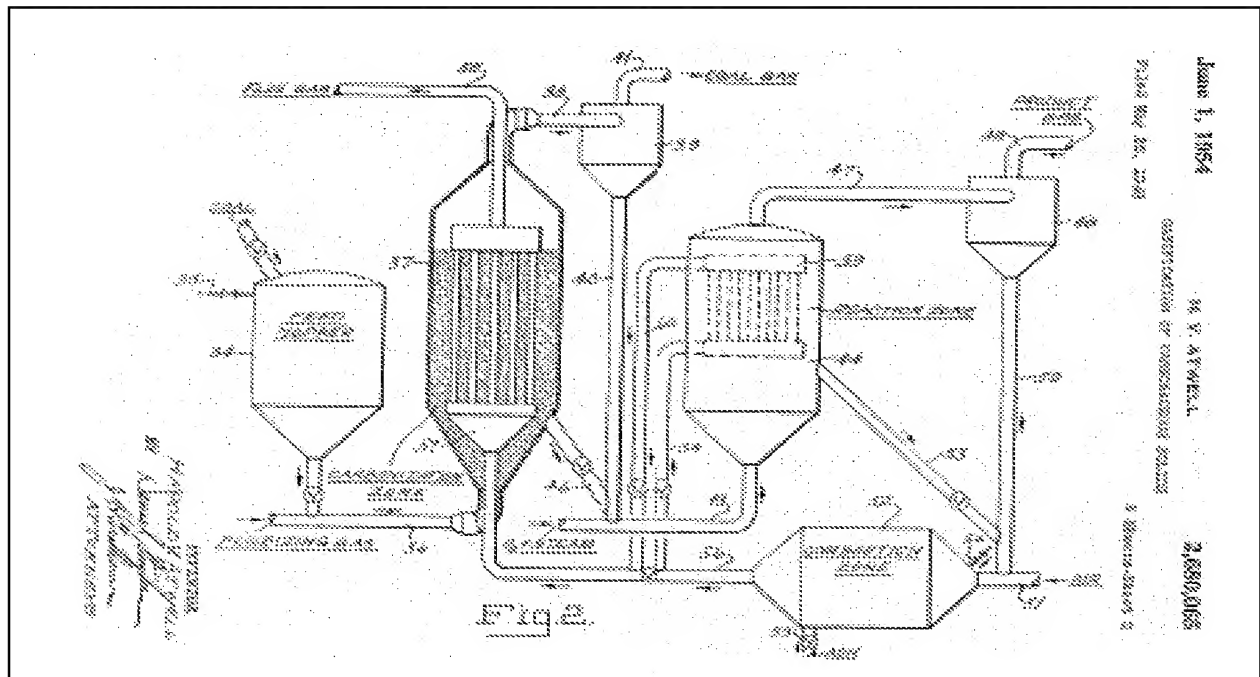
The rejection of Claim 19, as being anticipated by Atwell is traversed, to the extent that it still applies. Atwell clearly does not disclose a pulse combustion device, and so it cannot anticipate Claim 19.

It is next submitted that one skilled in the art would not be inclined to modify the system seen in Atwell’s Fig. 2 to incorporate pulse combustion devices of the sort disclosed in Mansour. Atwell’s system employs a “combustion zone 52” to provide indirect heat to the first fluidized bed and also to the second fluidized bed. The combustion zone 52 is fueled by “carbonaceous particles and ash separated from the product gas stream in separator 48 (which) pass through line 50 into admixture with air in line 51”, and also by “additional carbonaceous material . . . supplied to the burner 52 from the reaction zone 44 through line 53 as desired.” In contrast, as seen in its Fig. 6, Mansour’s reactor solids obtained from ‘screw-type solids withdraw valve 37’ and

'cyclone 30' are not employed to fuel the pulse combustor. In fact, as described at Mansour's col. 20, lines 16-27, these solids comprise (non-combustible) inorganic salts, along with some recovered carbon. Nothing in Mansour's Fig. 2 or the associated text suggests that one can fuel the pulse combustion device with such solids. Accordingly, one skilled in the art would simply would not modify Atwell to employ the pulse combustion device of Mansour for indirect heating.

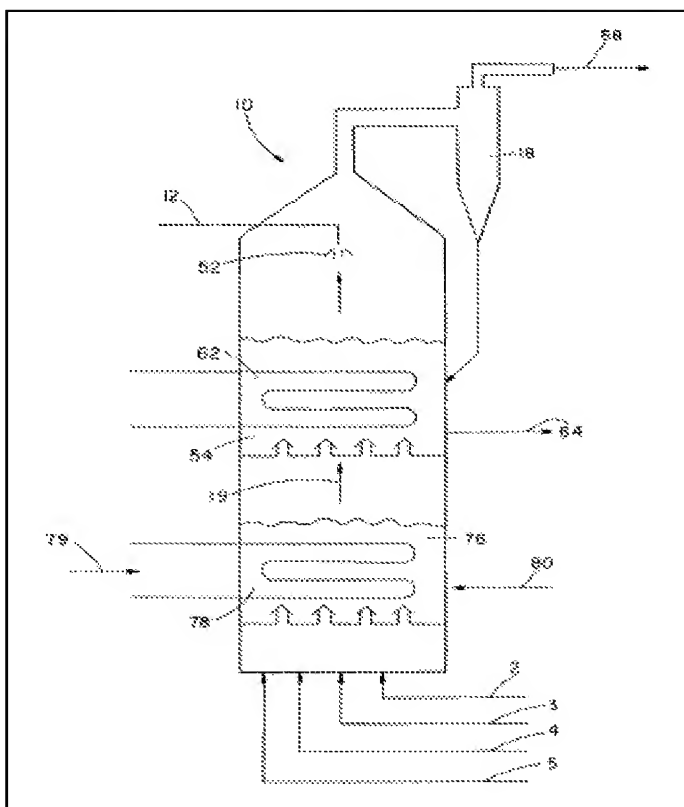
It is further submitted that even if one were to modify Atwell's first fluidized bed 37 to employ pulse combustion devices of the sort taught by Mansour, one still would not arrive in a system in accordance with pending Claim 19. As stated by the Examiner on page 3 of the Oct 4, 2008 office action, Atwell's second fluidized bed 44 is at a higher temperature than the first fluidized bed 37 due to the fact that "gas from combustion zone, 52, is fed to the second fluidized bed first, and subsequently to the first fluidized bed." If, however, one were to remove Atwell's combustion zone 52, and place pulse combustion devices in Atwell's fluidized bed 37, the temperature of the first fluidized bed 37 would be *higher* than in the second fluidized bed 44, and so would not meet the claimed limitation of "the second fluidized bed being at a temperature higher than the temperature of the first fluidized bed."

In view of the foregoing, it is submitted that Claim 19 defines over any combination of Atwell and Mansour.



Rejection of Independent Claim 19 as being anticipated under 35 USC 102(b) by Monacelli/Patentability of Claim 19 over Monacelli in view of Mansour

The rejection of Claim 19, as being anticipated by Monacelli is traversed. Monacelli's gasifier reactor 10 of Fig. 3 is reproduced below.



In formulating the rejection of Claim 19, the Examiner argued that Monacelli discloses: (1) “feeding a carbonaceous material to a first fluidized bed 54¹”; (2) “extracting bed solids containing carbon from the first fluidized bed and feeding the extracted solids to a second fluidized bed² (recirculation, C6/L40-45)”; (3) “the second fluidized bed being at a temperature higher than the first fluidized bed (C6/L30-39)” and (4) “the second fluidized bed having a

¹ Monacelli calls this the “gasification bed 54” or the “upper fluidized bed” which has an “upper heat exchanger 62”.

² Presumably, the Examiner is referring to second fluidized bed 76 in Monacelli Fig. 3. Monacelli calls this the “lower fluidized bed 76”, which has a “lower heat exchanger 78”.

fluidizing medium comprising steam and an oxygen-containing gas (C6/L7-20)”, (5) “a first portion of the extracted bed solids is oxidized in the second fluidized bed and a second portion of the extracted bed solids is endothermically converted to a gas in the second fluidized bed, to thereby form a second product gas stream (col. 4, lines 33-68)”.

It is respectfully submitted that the Examiner is mistaken on at least item (5). Nothing in Monacelli discloses that the second fluidization bed 76 is the situs for endothermic conversion of the extracted bed solids to a gas. As stated at col. 4, lines 52 – 63, the “gasification reaction” takes place in the first fluidized bed 54. Furthermore, as stated at col. 6, lines 1 – 20, the second fluidized bed 76 principally serves to heat the various fluidizing gases in preparation for forming the “fluidizing means 19” used by the first fluidized bed 54:

FIG. 3 is an alternate embodiment of gasifier reactor (10). In this embodiment, there are two fluidized beds (54), (76) operating in series with respect to gas flow. Throughout the several views, like numerals designate like or similar features. Fluid bed (76) provides the fluidizing means (19) and may be used in conjunction with or as a substitute for air/steam heater (14).

The fluidizing gases for the gasification reactions enter the process as relatively cold streams at the lower fluidized bed (76). Air (2) is provided to the bed (76) as a fluidizing gas at approximately 250.degree. F. Air at this temperature is obtained in a steam coiled preheater (46) with 50 PSI steam. Processed steam (3) is also provided to the reactor (10) for the bed (76). The processed steam (3) is generated using a flue gas waste heat boiler (48). Both the air stream (2) and the steam stream (3) are too cold to add directly to the gasification bed (54). A significant fraction of the total heat input is required just to bring them up to bed temperature. Thus, a heat exchanger (78) is preferably used in bed (76). Any other suitable external heating method may also be used.

Since Monacelli’s second fluidized bed 76 does not endothermically convert a second portion of the extracted bed solids to a gas, it is submitted that no combination of Monacelli and Mansour renders obvious pending Claim 19.

Furthermore, Claim 19 now also recites that “second fluidized bed is separate from the first fluidized bed.” This feature can be seen in Fig. 5 of the present application, where it is clear that the second fluidized bed 40 is separated from the first fluidized bed 14. In contrast, both of Monacelli’s fluidized beds 54, 76 are found in the same gasifier reactor. Mansour teaches no such separate fluidized bed.

In view of all the foregoing, it is submitted that pending Claim 19 defines over any combination of Monacelli and Mansour.

Separate Patentability of Dependent Claim 27 over either Atwell or Monacelli in view of Mansour

Claim 27 recites that the “wherein the second fluidized bed is heated by oxidizing carbon in the bed, and without an external heat source.” This contrasts with Atwell and also Monacelli, both of which show heat exchangers in the second fluidized bed. In this regard, the Examiner’s attention is drawn to Atwell’s Fig. 2 which shows a heat exchanger 59 present in ‘reaction zone 44’, and to Monacelli’s Fig. 3 which shows a heat exchanger 78 present in ‘second fluidized bed 76’. Given that both Atwell and Monacelli tout the heat exchangers 59, 78, respectively, it is submitted that claim 27 defines over either of these references in view of Mansour.

Separate Patentability of Dependent Claim 114 over Atwell in view of Mansour

New claim 114, which depends on Independent Claim 19, recites that the extracted solids and oxygen-containing gas are separately introduced to the second fluidized bed.

A system of introducing extracted solids and oxygen via separate ports (i.e., not admixed prior to introduction to the second fluidized bed) is not taught by Atwell. Instead, Atwell discloses a process wherein the carbonaceous particles separated from the coal gas in separator 39 pass through line 42 into line 43 where they are admixed with a gas stream comprising oxygen and steam and then carried into the reaction zone 44. (see Atwell’s column 4, lines 57-63, and Fig. 2).

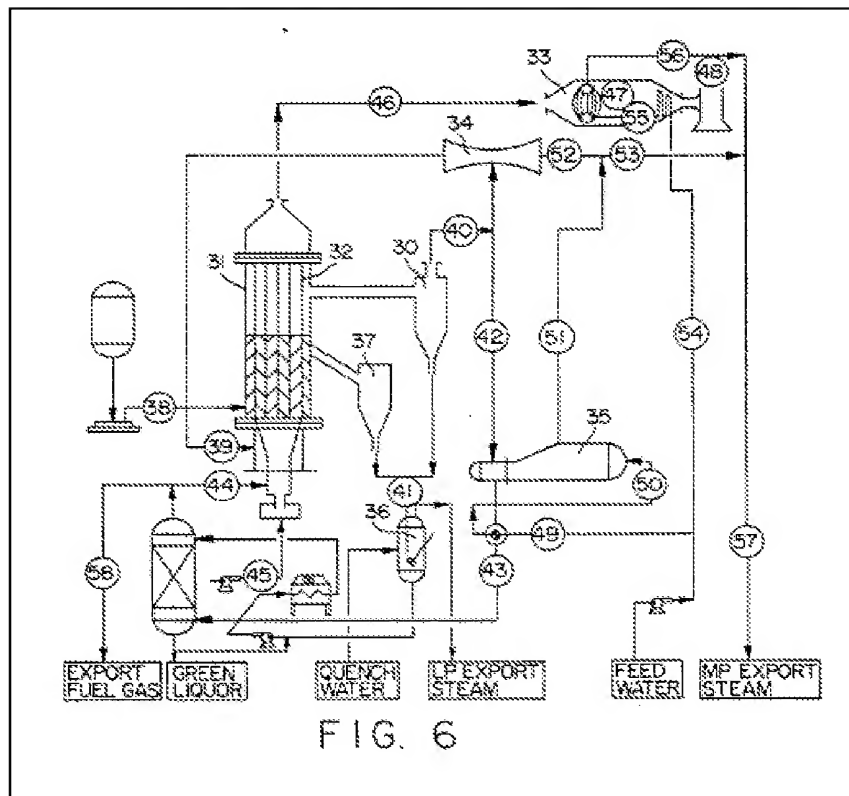
It would not be obvious to modify Monacelli to include the pulse combustion device of Mansour (relevant to pending Independent Claims 19, 33, 94 & 106)

Contrary to the Examiner’s position taken in paragraphs 9 and 10 of the office action (at page 13), it is submitted that one of ordinary skill in the art at the time of the invention would not have utilized a pulse combustion device in the process disclosed by Monacelli, as taught by Mansour. Indeed, Monacelli and Mansour both ostensibly teach away from such a modification

Mansour's Fig. 6, reproduced below, shows a pulse combustion device provided with resonant tubes which extend throughout the length of the reactor 31, thus heating the bed therein.

In contrast, Monacelli's gasification reaction is carried out in the first or "upper" fluidized bed (54)(see column 6, 25-29). The lower (or 'second') fluidized bed (76) contains a heat exchanger (78) that is simply used to heat the air stream (2) and the steam stream (3) which are too cold to add directly to the gasification/ upper fluidized bed (54)(see column 6, line 15-20). As such, the lower fluidized bed (76) is used as a heating means for incoming gas and fluid while the upper fluidized bed (54) serves as the place where the actual gasification reaction occurs. Most importantly, Monacelli's lower bed 76 and upper bed 54 have separate heat exchangers, 78 and 62, respectively, so that the corresponding bed temperatures may separately be controlled. Employing Mansour's single pulse combustion device throughout the entire reactor (see Mansour's Fig. 6) would frustrate this feature of Monacelli.

For this reason, it is submitted that one skilled in the art, given Monacelli, would not employ Mansour's pulse combustion device.



Rejection of Independent Claim 33 as being anticipated by Monacelli/Patentability of Claim 33 over Monacelli in view of Mansour

Claim 33 recites that a gaseous medium is fed through a solids collection reservoir and that “a first portion of the carbon particles contained in the solids collection reservoir is oxidized and a second portion of the carbon particles contained in the solids collection reservoir is endothermically converted to a gas.” (emphasis added). One embodiment of the claimed solids collection reservoir can be seen in Fig. 6 of the present application, in the form of a bed drain nozzle 40. Also, as stated in paragraph [0014] of the present application, the “bottom portion” of the fluidized bed is said to be in communication with the solids collection reservoir, and so the “bottom portion” is not coextensive with the claimed “solids collection reservoir”.

In formulating the rejection of Claim 33, the Examiner argued that Monacelli’s “lower fluidized bed 74” constituted the claimed “solids collection reservoir”.

It is first submitted that Monacelli’s lower fluidized bed 74” is not a “solids collection reservoir” within the meaning of pending claim 33, simply because Monacelli’s lower fluidized bed 74 is not said to collect solids, nor is it said to communicate with anything that readily appears to play the role of a “solids collection reservoir”.

It is further submitted that even if one were to consider Monacelli’s lower fluidized bed 74” to be a “solids collection reservoir”, for reasons stated above with respect to claim 19, Monacelli’s “lower fluidized bed 74” does not have “carbon particles contained (therein which are) endothermically converted to a gas.” Therefore, Monacelli cannot anticipate original claim 33. Furthermore, claim 33 is not rendered obvious, even assuming, arguendo, that one were to modify Monacelli to include the pulse heaters of Mansour.

In view of the foregoing, it is submitted that pending claim 33 defines over any combination of Monacelli, Mansour and Tanca.

Rejection of Independent Claim 33 as being anticipated by Mansour/Patentability of Claim 33 over Mansour

The Examiner’s rejection of Claim 33 as being anticipated by Mansour is traversed. In formulating this rejection, the Examiner argued at page 9 of the office action that Mansour discloses:

the fluidized bed containing a top portion and a bottom portion (See Fig. 6), the bottom portion being in communication with a solids collection reservoir (37, Fig. 6) . . and feeding a gaseous medium (steam, etc.) through the solid collection reservoir (C10/L49-53). (emphasis added)

Mansour further discloses a first portion of the carbon particles contained in the solids collection reservoir (bottom of fluidized bed, 31) is oxidized (gasified, see abstract) and a second portion is endothermically converted to a gas (steam reformed, see abstract). (emphasis added)

Mansour's Fig. 6 is reproduced below. The Examiner seems to refer to two different components, item 37 and item 31 of Mansour's Fig. 6, as the claimed "solids collection reservoir". It is first submitted that this characterization of Mansour is wholly unintelligible and the rejection should be withdrawn for this reason alone. Applicants simply cannot formulate a cogent response.

Notwithstanding the foregoing, it is further submitted that the material entering in Mansour's "screw-type solids withdrawal valve 37" (which subsequently enters the dissolution tank 36) does not have one portion oxidized and another portion endothermically converted into a gas, as called for in pending Claim 33.

Finally, it is further submitted that the "bottom of fluidized bed 31" in Mansour does not constitute a "solids collection reservoir" within the meaning of pending claim 33. As seen in Mansour's Fig. 6, the pulse combustor occupies the entire lower portion of the reactor 31, and so no portion of the bottom of the reactor 31 can serve as the claimed "solids collection reservoir."

For all the foregoing reasons, it is submitted that Claim 33 is neither anticipated by, nor rendered obvious by, Mansour.

Rejection of Independent Claims 94 and 106 as being anticipated by Monacelli/Patentability of Claims 94 and 106 over Monacelli in view of Mansour

For reasons explained above with respect to pending Claim 33, it is submitted that (a) one skilled in the art would not be inclined to modify Monacelli to incorporate the pulse combustion device of Mansour; and (b) neither Monacelli nor Mansour disclose a solids collection reservoir within the meaning of pending claims 94 and 106. It is therefore submitted that claims 94 and 106 also define over any combination of Monacelli and Mansour.

With respect to all claims not specifically mentioned, it is submitted that these are patentable not only by virtue of their dependency on their respective base claims and any intervening claims, but also for the totality of features recited therein.

Reconsideration of the application is requested. All pending claims are believed to be allowable over the prior art of record. An early notice of allowance is solicited so that the application may proceed to issue.

No fee is believed to be due for the claim changes of the present amendment. Should a fee be required, the Director is authorized to charge any such fee to Womble Carlyle's Deposit Account No. 09-0528 (T127 1010.1).

Respectfully Submitted,

Date: April 2, 2008

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